

REMARKS

The present Amendment After Final is timely filed by September 11, 2006, by virtue of the petition for a two-month extension of time filed herewith. Claims 1 – 3, 5 – 19 and 23 are pending and stand rejected. Claim 12 is presently amended to correct the inadvertent omission of the word “of” from the claim in Applicants’ response filed January 31, 2006. The correction is typographical in nature, and the response raises no new issues for consideration. Entry of the response and reconsideration are thus respectfully requested in view of the forgoing amendment and the following remarks.

Rejection of claims 1, 3, 5 – 12, 17 and 18 under 35 U.S.C. § 103(a):

Claims 1, 3, 5 – 12, 17 and 18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 2000-311928 (“Yasushi”) in view of U.S. Patent No. 6,372,581 (“Bensahel”). Applicants respectfully traverse the rejection.

Regarding claim 1, the Examiner alleges that Yasushi teaches a method of determining the nitrogen content of a nitrided gate oxide layer on a semiconductor substrate, comprising oxidizing the nitrided gate oxide layer on the substrate, where the step of oxidizing the nitrided gate oxide layer distances the nitrided gate oxide layer away from the semiconductor substrate, as currently claimed. The Examiner, however, admits that the suggestion to combine the references is based in part on the inherent disclosure of Yasushi:

Yasushi does not expressly teach this effect, but since Yasushi teaches reoxidizing the nitrided gate manner [sic] by heating the sample in an oxygen atmosphere—page 2, lines 6 – 8 of the translation—the same method disclosed by Applicant, *it is inherent* that the step of oxidizing the nitrided gate oxide layer taught by Yasushi will also distance the nitrided gate oxide layer away from the semiconductor substrate.

Office Action, p. 2, ll. 19 – 24 (emphasis added). The Examiner further admits that Yasushi does not teach using NO to nitride the gate oxide layer; the Examiner alleges that Bensahel motivates substituting NO for N₂O for this purpose. Office Action, p. 3, ll. 6 – 9.

Applicants' arguments regarding the proposed combination of Yasushi and Bensahel in the Amendment filed January 31, 2006 are incorporated by reference herein. In short, Applicants state that both Yasushi and Bensahel are silent with respect to a method comprising oxidizing the nitrided gate oxide layer on the substrate, where oxidizing distances the nitrided gate oxide layer away from the semiconductor substrate; therefore, neither reference would have suggested such a step to one of ordinary skill in the art. Further, Bensahel teaches away from the proposed combination of references, especially where he states that the prior art method of using NO for nitriding gate oxide layers "does not allow the presence of nitrogen to be localized precisely at the interface between the substrate and the gate oxide layer (Si/SiO₂ interface)." Bensahel, Col. 1, ll. 42 – 45.

In response, the Examiner alleges (Office Action, pp. 13 – 15):

Applicant does not claim or disclose which feature of the reoxidation process results in the nitrided gate oxide layer being distanced away from the semiconductor substrate. As best understood by the Examiner, the reoxidation process taught by Applicant comprises heating the nitrided gate oxide in an oxygen atmosphere (last paragraph of page 9 in the instant specification), which is the same as the reoxidation process taught by Yasushi. There is therefore no indication that Applicant's reoxidation process would produce results different from Yasushi's.

Additionally, the rejections presented in this and the last Office action rely upon the teachings of Bensahel only to establish the obviousness of using NO instead of N₂O to nitride an oxide layer (Applicant additionally discloses that in the instant invention either NO or N₂O can be used in the nitridation step—see second full paragraph on p. 9). The disclosure of Yasushi is relied upon to teach the reoxidation step, and as discussed above, Applicant does not disclose or claim the criticality of any particular reoxidation step or process in producing a distance between the nitrided gate oxide layer and the substrate. Absent some such teaching, it is inherent that the reoxidation process taught by Yasushi will have the same result as the reoxidation process taught by Applicant, since they both comprise heating the substrate in an oxygen atmosphere.

(1) The rejection erroneously bases an obviousness rejection on unrecognized, allegedly inherent characteristics of the cited art.

It is legal error to base an obviousness rejection on undisclosed, unrecognized, allegedly inherent properties of the cited references. A retrospective view of inherency is no

substitute for some teaching or suggestion in the art supporting an obviousness rejection. *In re Rijckaert*, 9 F.3d 1531, 1534 (Fed. Cir. 1993); *In re Spormann*, 363 F.2d 444, 448 (C.C.P.A. 1966) (“That which may be inherent is not necessarily known. Obviousness cannot be predicated on what is unknown.”); *In re Antonie*, 559 F.2d 618, 620 (C.C.P.A. 1977) (holding an obviousness rejection improper, where the prior art did not reveal the property that applicants had discovered); *see also In re Newell*, 891 F.2d 899, 901 (Fed. Cir. 1989); *In re Grasselli*, 713 F.2d 731, 739 (Fed. Cir. 1983).

In the present case, the Examiner alleges that “*it is inherent* that the step of oxidizing the nitrided gate oxide layer taught by Yasushi will also distance the nitrided gate oxide layer away from the semiconductor substrate.” Office Action, p. 2, ll. 22 – 24 (emphasis added). The Examiner, however, has not established that the allegedly inherent characteristic of Yasushi’s method necessarily occurs. *See In re Oelrich*, 666 F.2d 578, 581-82 (C.C.P.A. 1981) (“Inherency, however, may not be established by probabilities or possibilities.”). Second, even if it were the case that Yasushi’s step of oxidizing the nitrided gate oxide layer distances the nitrided gate oxide layer away from the semiconductor substrate, the Examiner has not pointed to a teaching or suggestion *in Yasushi or any other prior art reference* that this occurs. Consequently, there is no evidence on the record that the artisan of ordinary skill would have appreciated the allegedly inherent characteristics of Yasushi’s method. Without some teaching or suggestion in the art to support the obviousness rejection, it is improper and should be withdrawn. *See, e.g., In re Rijckaert*, 9 F.3d at 1534; *In re Spormann*, 363 F.2d at 448; *In re Antonie*, 559 F.2d at 620.

(2) The rejection erroneously discounts art that teaches away from the proposed combination of references.

It is also legal error to disregard the teachings of the cited references as a whole, particularly where they teach away from the proposed combination of references. It is well

established that a prior art reference must be considered in its entirety, including portions that would lead away from the claimed invention. *See generally* M.P.E.P § 2141.02 (VI), 8th ed., revised October 2005 (discussing *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1550 (Fed. Cir. 1983)). In the present case, Bensahel teaches away from the claimed method, for example, where he states that the prior art method of using NO for nitriding gate oxide layers “does not allow the presence of nitrogen to be localized precisely at the interface between the substrate and the gate oxide layer (Si/SiO₂ interface).” Bensahel, Col. 1, ll. 42 – 45. Further, in contrast to a method where the step of oxidizing the nitrided gate oxide layer distances the nitrided gate oxide layer away from the semiconductor substrate, as presently claimed, Bensahel’s method seeks to “obtain a gate oxide layer . . . principally located close to the substrate/gate oxide layer interface.” Bensahel, Col. 1, ll. 63 – 65. The Examiner has not disagreed with Applicants’ characterization of Bensahel’s teachings, but instead has stated, “the rejections presented in this and the last Office action rely upon the teachings of Bensahel *only* to establish the obviousness of using NO instead of N₂O to nitride an oxide layer.” Office Action, p. 14, ll. 15 – 17 (emphasis added). The Examiner cannot discount the teachings in the art simply by not relying on those teachings in the stated rejection. Since the rejection is based on legal error, it is improper and should be withdrawn.

(3) The rejection erroneously requires Applicants to “show that the chosen claim limitations are critical.”

It is a further legal error to impose a requirement on Applicants to “show that the chosen claim limitations are critical.” The Examiner relies on *In re Woodruff*, 919 F.2d 1575, 1578 (Fed. Cir. 1990) to allege the following:

Finally, the specification contains no disclosure of either the critical nature of the claimed process or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the Applicant must show that the chosen limitations are critical.

Office Action, p. 8, ll. 5 – 8. *Woodruff* does not stand for this proposition; rather, the cited passage from *Woodruff* speaks to unexpected results and “criticality” in the context of a claim comprising a recited range that overlaps with a range for the same parameter found in the prior art. *See In re Woodruff*, 919 F.2d at 1577. In the relevant holding, the court stated:

The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. These cases have consistently held that in such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.

In re Woodruff, 919 F.2d at 1578 (citations omitted); *see also* M.P.E.P. § 2144.05(III), 8th ed., revised October 2005 (discussing *Woodruff* in this context). The situation that *Woodruff* addresses simply is not present in this case; therefore, the Examiner’s reliance on *Woodruff* is inapposite.

Nor do Applicants need to disclose unexpected results, as the Examiner implies. Unlike the situation in *Woodruff*, the rejection does not make a proper *prima facie* case of obviousness, for the reasons set forth above. Where *prima facie* obviousness is not demonstrated, it is improper to require an applicant to rebut the rejection by showing unexpected results by declaration, and it certainly is improper to require Applicants to show unexpected results in the original disclosure. *See In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990) (discussing a *prima facie* case as a procedural tool); *see also In re Geisler*, 116 F.3d 1465, 1469 (Fed. Cir. 1997). Accordingly, the requirement that Applicants “show that the chosen claim limitations are critical” is improper, and the rejection should be withdrawn.

(4) The cited art does not disclose the advantages achieved by distancing the nitrided gate oxide layer away from the semiconductor substrate.

Although Applicants presently do not need to show unexpected results, the specification in fact discloses significant advantages in moving or distancing the nitrided region away from the substrate/oxide interface. E.g., Specification, p. 13, l. 4, *et seq.* For

instance, this improves carrier mobility and consequently the speed of the device, and it improves threshold voltage or the extent of boron penetration into the gate oxide layer. Specification, p. 13, ll. 6 -13. The cited art does not teach or suggest any of these advantages.

Rejection of claims 2 and 13 – 16 under 35 §U.S.C. 103 (a):

Claim 2 and 13 – 16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yasushi in view of Bensahel as applied to claims 1 and 12, and further in view of Wolf *et al.*, “Silicon Processing for the VLSI Era,” Vol. 1 – 3, Lattice Press, CA (1990) (“Wolf”). Applicants traverse the rejection.

The rejection does not allege that Wolf teaches or suggests the claimed element not taught or suggested by the combination of Yasushi and Bensahel as applied to Claims 1 and 12, namely oxidizing the nitrided gate oxide layer on the substrate, where the step of oxidizing distances the nitrided gate oxide layer away from the semiconductor substrate. Accordingly, Wolf does not correct the deficiencies of the combination of Yasushi and Bensahel; therefore, the rejection does not make a *prima facie* case of obviousness and should be withdrawn.

Rejection of claim 19 under 35 §U.S.C. 103 (a):

Claim 19 is rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,862,054 (“Li”) in view of Yasushi and Bensahel. Applicants traverse the rejection.

The Examiner admits that Li does not teach or suggest oxidizing the nitrided gate oxide layer on the substrate, where the oxidizing distances the nitrided gate oxide layer away from the substrate. Accordingly, Li does not remedy the deficiency in the combination of Yasushi and Bensahel, and the rejection should be withdrawn.

Rejection of claim 23 under 35 §U.S.C. 103 (a):

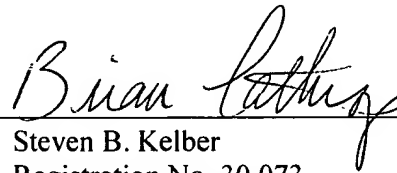
Claim 23 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Li in view of Yasushi and Bensahel as applied to claim 19, and further in view of Wolf. Applicants traverse the rejection for the reasons stated above. That is, the Examiner admits that Li does not teach or suggest oxidizing the nitrided gate oxide layer on the substrate, where the oxidizing distances the nitrided gate oxide layer away from the substrate. Accordingly, Li does not remedy the deficiency in the combination of Yasushi and Bensahel, and the rejection should be withdrawn.

CONCLUSION

In view of the above amendments and remarks, Applicants respectfully request a Notice of Allowance. If the Examiner believes a telephone conference would advance the prosecution of this application, the Examiner is invited to telephone the undersigned at the below-listed telephone number.

Respectfully submitted,

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